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Approved For Release 2004/08/26 : CIA-RDP78B04747A002200010013-3

CONFIDENTIAL

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23 August 1967

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P. O. Box 9474
Rosslyn Station
Arlington, Va. 22209

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Reference:

Gentlemen:

In accordance with telephone conversation of
17 August 1967 between [REDACTED]
we are enclosing one (1) set reproducible and one (1) copy of
a List of Drawings for each of the referenced contracts.

25X1

Very truly yours,

25X1

Executive Vice President

LHB/aw
Encs. (4)

DECLASS REVIEW by NGA

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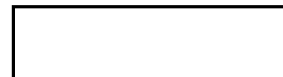
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LIST OF DRAWINGS

Project 552A

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Project 552 A

*Drawings included in Proj. 552

NUMBER	REVISION LETTER	NAME
104302 *	E	Ball Bushings, Preloaded
104701 *	G	Pulley, Outer Ring Retainer
104702 *	G	Holder, Wedge
104939 *	G	Timing Belt
104946 *	F	Retainer Wedge
105064 *	A	Bevel Modification (Gear)
105065 *	D	Slip Clutch & Gear Modification
105077 *	C	Clamp
105696 *	A	Lamp
105786 *	F	Pulley
106142 *	D	Cam Microswitch Actuator
106264 *	G	Wedge 0° 45' Deviation
106276 *		Flexible Shaft Coupling
106281 *	D	Ball Bearing Pair
106623 *	B	Ball Bushing Modified for 1" Shaft
106624 *	B	Ball Bushing Modified for 1-1/4" Shaft
106654 *	A	Gear
106655 *	A	Gear
106656 *	A	Gear
106657 *	A	Gear
106666 *	B	Retainer, Bearing, Inner Ring
106667 *	B	Ball Bearing
106671 *	A	Bearing
106672 *	D	Bearing
106700 *	A	Miter, Gear Modified
106729 *	C	Bearing, Flanged
106732 *	A	Bearing
106735 *		Clutch
106736 *	A	Motor
106737 *	A	Capacitor
106750 *	C	L.H. Indexing Shaft
106756 *	C	Achromatic Lens
106783 *	E	Motor Translator and Register

Project 552A

*Drawings included in Proj. 552

NUMBER	REVISION LETTER	NAME
106796 *	B	Timing Belt
106802 *	C	Timing Belt
106805 *	B	Bearing
106806 *	C	Bearing "DB" Duplex Pair
106808 *	C	Bearing
106809 *	C	Bearing
106822 *	A	Bearing
106842 *	B	Microswitch (Low Travel Roller Level)
106843 *	B	Microswitch (Roller Level)
106850 *	C	Motor DC (Lens Turret Indexing)
106852 *	B	Sprocket, Modified
106854 *	F	Cam - Tail Stock
106859 *	A	Adaptor
106864 *		Spring
106901 *		Gear (Modification)
106902 *	A	Bearing
106903 *	B	Ball Bearing
106924 *		Motor
106929 *		Ball Bushing
106931 *		Spur Gear
106933 *		Spur Gear
106946 *	B	Bearing - Film Rollers
106989 *	C	Switch
107000 *	A	Switch, Rotary Selector
107007 *	E	Switch, Rocker
107008 *	G	Switch, Rocker
107009 *	H	Switch, Rocker
107011 *	B	Switch, Pushbutton
107015 *	B	Switch, Multi-position Pushbutton
107019 *	B	Filter, R.F.I.
107020 *	A	Filter, R.F.I.
107021 *	B	Transformer, Constant Voltage

Project 552 A

*Drawings included in Prj. 552

NUMBER	REVISION LETTER	NAME
107023 *	B	Transformer, Line Booster
107024 *	C	Switch (V3-26)
107028 *	B	Capacitor
107039 *	B	Indicator
107031 *	A	Capacitor
107033 *	B	Rectifier
107040 *	A	Indicator Holder
107063 *		Potentiometer
107118 *	A	Mirror
107137 *	A	Filter
107138 *	A	Check Valve
107140 *	A	Vacuum Pressure Switch
107165 *	A	Double Convex Lens
107198 *	A	Relay, Power
107199 *	C	Relay, Latching
107200 *	D	Relay
107201 *	B	Relay
107260 *	A	Transformer
107261 *	A	Transformer
107264 *		Switch
107267 *	A	Transformer
107268 *	C	Diode
107271 *	A	Capacitor
107272 *	A	Capacitor
107279 *		Objective Lens
107281 *		Lens 60.5mm F.L. Double Convex
107291 *	B	Circuit Breaker
107296 *	A	Resistor
107350 *		Lens Element Rework
107354 *	A	Lens Modification
107355 *	A	Bearing, Flanged
107384 *		Spiral Miter Gear (Pair)
107399 *		Elapsed Time Meter
107420 *	C	Fan - Cool High Int. Light

Project 552 A

*Drawings included in Project 552

NUMBER	REVISION LETTER	NAME
107423 *	B	Lock Screw
107449 *	A	Lamp - TRV - Focus DKM
107531 *	B	Capacitor
107532 *	A	Capacitor
107533 *		Resistor
107534 *	B	Resistor
107535 *	B	Resistor
107536 *	A	Resistor
107537 *	A	Resistor
107538 *	A	Transistor
107539 *	A	Transistor
107543 *	A	D.C. Power Module
107617 *	C	Relay
107619 *	A	Switch, Rocker
107621 *	A	Circuit Breaker
107658 *	A	12 Pitch Steel Miter Gear
107689 *		Lens
107690 *		Ball Bushing
107693 *	B	Spherical Bearing
107695 *		Counter Circuit
107696 *		Spur Gear
107697 *	A	Spur Gear
107698 *		Spur Gear
107699 *	A	Spur Gear (Idler)
107701 *	B	Bevel Gear
107745 *		Microswitch
107762 *	A	Resistor
107763 *	B	Resistor
107764 *	B	Resistor

Project 552 A

*Drawings included in Proj. 552

NUMBER	REVISION LETTER	NAME
107766 *	D	Diode Zener
107767 *	A	Diode Zener
107776 *	A	Switch Wafer
107802 *	A	Ball Bearing
107881 *	A	Shaft Extender "Y" Screw
107882 *		30 tooth spur Gear Lead Screw
107883 *		40 " " " " "
107885 *		Transistor
107886 *		Transistor
107887 *		Transistor
107889 *		Resistor
107890 *		Resistor
107891 *		Resistor
107892 *		Resistor
107893 *		Resistor
107894 *		Resistor
107895 *		Resistor
107896 *		Resistor
107899 *		Capacitor
107900 *		Diode Zener
107901 *	B	Diode Zener
107930 *	B	Resistor
107931 *	A	Potentiometer
107933 *	A	Potentiometer
107934 *	A	Potentiometer
107935 *	B	Resistor
107937 *	A	Potentiometer
107938 *	A	Resistor
107939 *	A	Resistor
107940 *	A	Resistor
107941 *	B	Resistor

Project 552 A

*Drawings included in Proj. 552

NUMBER	REVISION LETTER	NAME
107943 *		Potentiometer
107944 *		Capacitor
107945 *		Capacitor
107946 *		Capacitor
107947 *		Capacitor
107948 *		Capacitor
107949 *		Capacitor
107950 *		Capacitor
107951 *		Capacitor
107952 *		Capacitor
107953 *		Capacitor
107954 *		Capacitor
107955 *		Capacitor
107956 *		Capacitor
107957 *	A	Capacitor
108089 *		Resistor
108117		Spur Gear
108118 *		Flexible Coupling
108255 *		Relay, Barber-Colman
108263 *		Relay, 34 Pole
108318 *		Capacitor
108319 *		Resistor
108320 *		Resistor
108321 *	A	Switch, Rocker
108386 *		Handwheel
108416 *	A	Diode
108417 *		Resistor
108418 *		Resistor
108419 *		Capacitor
108420 *		Capacitor
108421 *		Capacitor
108422 *		Capacitor

Project 552 A

*Drawings included in Proj. 552

NUMBER	REVISION LETTER	NAME
108423 *		Resistor
108424 *		Resistor
108425 *		Resistor
108449 *		Resistor
108450 *		Resistor
108534 *		Resistor
108535 *		Switch, Toggle
108536 *		Buzzer
108546 *		Field Lens for LX Lens
108548	C	7X Field Lens
108594 *		Film Drive Generator
108692-1 *	C	Rotary Solenoid
108592-2 *	C	Rotary Solenoid
108728 *		Heat Reflector Filter
109045		Switch
109683	A	Objective Lens
109941		Rod, Vacuum Stop
109946		Shaft, Vacuum Bracket
109948		Bracket Side Bellows
109950		Spacer, Flat
109954		Film Spring Holddown
109964 *		Tie Down Film Guide
109986 *		Thumb Screw
109998		Shim Spacer
109999 *		Vacuum Gauge

*Drawings included in Proj. 552

NUMBER	DIVISION LIMIT	NAME
402020*	C	Mirror
402266 *	F	Enhancer Motor Modification
402494 *	B	Shaft-Joy Stick-Pivot Brg.
402499 *	C	Plate-Switch Mounting
402656 *	B	Bearing Follower Shaft, Eccentric
402657 *	C	Bearing Follower Shaft, Eccentric
402655 *	C	Bearing Follower Shaft, Eccentric
402666 *	C	Bearing Follower Shaft, Eccentric
402683 *	B	Disc. Mounting
402685 *	A	Sprocket Modified
402686 *	B	Sprocket Modified
402687 *	A	Gear Modified
402688 *	A	Roller Film Guide
402689 *	B	Roller Film Guide
402690 *	B	Bearing Retainer
402691 *	A	Sprocket & Bearing Retainer
402692 *	A	Shaft Film Roller
402700 *	A	Mirror Support
402701 *	A	Mirror, Right
402702 *	A	Mirror, Left
402703 *	B	Cube Assy
402704 *	C	Block, Bearing Mounting
402706 *	A	Roller, Film Guide
402707 *	B	Shaft, Film Guide
402709 *		Actuator, Limit Switch
402710 *		Spacer Plate, Limit Switch
402711 *		Mounting Plate, Limit Switch
402712 *		Gear Modified, Limit Switch
402715 *	A	Mirror, Right
402716 *	A	Mirror, Left
402717 *	A	Support, Mirror

A

*Drawings included in Proj. 552

402720 *	B	Mirror
402721 *	C	Mirror
402722 *	A	Mirror
402726 *	A	Gear Clutch
402727 *	A	Nut, Drive
402728 *	A	Shaft, Drive
402731 *	B	Support Mirror
402732 *	B	Cube Assy
402745 *	C	Bearing Retainer
402754 *	B	Pulley
402756 *	C	Pulley
402762 *	B	Pulley
402766 *	A	Post
402767 *	B	Driver, Hub
402768 *	C	Pulley
402771 *	C	Switch Plate
402772 *	C	Switch Adj. Plate
402773 *	C	Switch Adj. Plate
402775 *		Gear Driver
402776 *		Gear Shifter
402777 *	A	Bearing
402778 *	B	Support, Sprocket
402779 *	B	Link Loop Former
402780 *	B	Roller Film
402781 *	C	Roller Loop Former
402783 *	B	Shaft
402784 *	A	Shaft
402786 *	D	Plunger
402790 *	A	Mirror
402809 *	C	Retaining Ring
402812 *	A	Shaft Bearing
402814 *		Pinion

NUMBER	SECTION LETTER	NAME
402816 *	A	Pivot Rod
402817 *	B	Shaft, Actuator & Interlock
402818 *	A	Gear Link
402819 *		Pinion (RH)
402820 *	B	Pressure Plate (Penta Index)
402822 *	C	Shield (Fiber Bundle)
402823 * -1 -2		Mirror Carriage Upper Deck
402824 *	A	Link, Mirror Ass'y Rear
402825 *	B	Link, Mirror Ass'y front
402827 *		Spacer
402828 *	B	Cam (Actuator Switch)
402829 *		Switch Mounting Plate
402830 *	C	Cam Intermittent (Modified)
402831 *	C	Interlock Cam, Upper Deck
402832 *		Bearing Block, Interlock Shaft, Upper Deck
402833 *		Shaft Mounting Block
402834 *	A	Link, Interlock Shaft, Upper Deck
402835 *	A	Spacer, Support
402842 *	A	Bracket, Handle Support, Left
402843 *	A	Bracket, Handle Support, Right
402853 * -1 -2	D	Extension, Shaft
402860 * -1 -2	B	Digitial
402862 *	D	Hanger
402873 * -1 -2 -3 -4	A	Block
402874 *	A	Block
402876 *	B	Block
402878 *	A	Block Lens (Reticle Projector)
402879 *		Retaining Ring
402880 *		Lens Housing
402883 *		Spring
402889 *		Retainer, Lens

402890 *	A	Spacer
402891 *	A	Stop Block
402893 * -1 -2 -3 -4 -5 -6	H	Protentiometer -90° --Joy Stick--
402901 *	A	Spherical Joint Ass'y Joy Stick Housing
402902 *	C	Spherical Joint Joy Stick Housing
402904 *	A	Lens Mount Modification (Right)
402905 *	B	Spacer
402906 *		Lens Holder, Rear, Adj.
402908 *		Shaft X-Y Joy Stick Slave Unit
402912 *	A	Lens Mount Adapter
402913 *		Lens Mount Adapter
402914 *		Lens Mount Adapter
402917 *	A	Spacer Gear Box
402919 *	A	Lens, Disassembly (40mm)
402920 * -1	B	Lens Barrel (40mm)
402922 * -2	A	Lens Mount (Wild Flootar)
402923 *	A	Lens Rework (32mm)
402924	B	Lens Mount (32mm Kinoptik Lens)
402926 *	A	Shaft, Lower
402927 *	A	Shaft, Upper
402928 *	A	Shaft, Eyepiece Link
402929 *	A	Support Filter
402932 *	A	Bracket (Solenoid)
402937 *	B	Drive Shaft-Elevation
402938 *	D	Support Block
402940 *	A	Bracket Cable Main Frame Loop
402941 *	A	Bracket Cable Loop X Carriage to Main Frame
402942 *		Spacer Receptacle to Support Bracket
402943 *		Bracket Support-Y Loop
402944 * -1	A	Mounting Block Y Cable Loop Support
402945 * -2		Lens Mounting Assembly

Project 552 A

NUMBER	REVISION LETTER	NAME
402946 *		Lens Mounting Modification (Left)
402947 *	B	Shaft, Gear Box
402964 *		Rest Plate
402965 *		Clamp Plate
402966 *		Bracket Filter
402994 *	C	Stop-Adjustable
403015 *		Mirror
403034 *	B	Pulley X & Y Motor To Gear Box
403035 *		Clamp Strip
403036 *		Cover Plate
403039 *	A	Drive Plate-Drive Pulley
403040 *		Retainer Plate Drive Pulley
403045 *	B	Spur Gear
403049 *	A	InterPupillary Scale (Lower Half)
403050 *	A	Interpupillary Scale (Upper Half)
403051 *		Rotating Counter Ass'y (Left Axis Rotation)
403052 *		Bracket, Plate
403057 * -1 -2	A	Guide Block
403058 *		Film Guide Roller Upper
403059 *	A	Shaft-Film Guide Idler
403060 *		Film Roller Shaft Hinged Roller
403061 * -1 -2	A	Support Bracket-Rear R.H. & L. H.
403062 *	B	Shaft-Guide
403065 *	A	Support Bracket-Front R. H. & L. H.
403081 *		Plate Access (Joy Stick)
403082 *		Ring (Joy-Stick)
403084 *		Shield Dust (Joy-Stick)
403086 *		Ring, Bellows (Joy-Stick)
403087 *		Retaining Ring Bearing (Joy-Stick)
403088 *	B	Link

Project 552 A

NUMBER	REVISION LETTER	NAME
403089 *		Link Ass'y
- 403090 *		Cover, Dust
403091 *		Film Guide, End
- 403093 *		Shaft Gear Joy-Stick
403099 *		TB 105-Ass'y
- 403100 *		Torque Bar
403101 *		Mounting Block
403102 *		Shaft
- 403103 *		Mirror, High Int. Lightsource
403104 *		Digidial
- 403105 *		Potentiometer Mount
403106 *	B	Bushing
- 403109 *		Lever - 360° Rotation Stop
403110 *		Stop Block 360° Rotation
403111 * -1 -2		Engraving of Differential Pulse Counter
403112 *		Rotating Counter Ass'y (Right Axis Rotation
- 403113 *		Bearing Clamp Lower
403122 *	A	Name Plate Objective Magnification
- 403137 *	C	Clip-Glass Platen Hold Down
403152 * -1 -2	A	Link Loop Former (Front)
- 403180 *	A	Bracket Component Board Mount
403181 *	B	End Supports Trim Pot Mount
- 403182 *		Marker Strip R. H. Trim Pot Mount
403183 *		Marker Strip L. H. Trim Pot Mount
- 403184 *	A	Fish Paper Trim Pot Mount
403185 *	B	Bracket Fan Mount
- 403202 *	A	Serial No. Plate -552 & 552A
403211 *		Support Bar Dual Joy Stick - Elect
- 403212 *		Clamp Plate-Flat Cable Support Rear

NUMBER	REVISION LETTER	NAME
403216 *		Hanger
403217 *		Hanger
403220 *		Counter Balance Weight
403334 *	B	Nut Plate, Index
403335 *		Spacer Magnification, Scale
403336 *		Knob, Magnification Scale
403337, *1-2		Assembly Magnification Scale
403338, *1-2-3		Limit Stop Washer
403339 *		Limit Stop Assembly
403350 *		Terminal Board, TB 1103
403351 *		Terminal Board, TB 1104
403352 *		Terminal Board, TB 1105
403400 *		Guide Adjusting Screw Eyepiece Interpupillary Adj.
403408 *	B	Name Plate, Film Drive Shift
403409 *	A	Name Plate, Film Threading
403411 *		.38X Field Lens
403413 *		Switch Block
403426 *		Retainer Ring .38X Field Lens
403427 *		Driver, Hub
403454 *	A	Link, Rear R. H.
403456 *	A	Link, Front R. H.
403458 *		Mount, Solenoid, R. H.
403465 *		Adaptor, Solenoid
403487 *		Stop Collar
403493 *		Rear Film Guide
403494 *		Front Film Guide
403495 * 1-2		Guide Bracket Filter Actuator Counter Balance
403504 *	A	Spool
403505 *	A	Fiber Cable Clamp

Project 552 A

*Drawings included in Proj. 552 -

NUMBER	REVISION LETTER	NAME
403506 *		Timer Bracket
403552 *		Y-Drive Flywheel
403573 *		Film Guide, Rear Center
403574 *		Film Guide, Front Center
403590 *		Center Cover
403612 *		Clamp, Joy Stick Rotation Right Channel
403613 *		Clamp, Joy Stick Rotation Left Channel
403649 *		Relay Bracket, Film Brakes
403650 *		Timer & Relay Mount Plate
403689 *		Timer & Relay Mount
403743 *		Pivot Support, Center Arm
403793 *	B	Holddown Potentiometer -90° Joy Stick Voltage Divider
403796 *		Adjustable Lens Mount
403797 * 1-2	A	Adjustable Lens Mount
403798 * 1-2		Block
403889 *		Manifold Back-up Strip
403891 * 1-2		Pressure Strip Film
403892		Strip Tie Down
403896 *		Vacuum Manifold
403995 *		Counter Balance Spool

NUMBER	REVISION LETTER	NAME
601419 *	E	Bearing Hanger
601420 *	B	Nut Hanger
601439 *	D	Bracket, Light Box F. & C. Support
601440 *	D	Shaft, Ball Bushing
601441 *	D	Shaft, Ball Bushing
601446 *	C	Guide Rail
601447 *	B	Guide Rail
601450 *	B	Plate, Mounting
601451 *	B	Shaft
601452 *	B	Block, Cable Mtg.
601455 *	F	Fiber Cable
601469 *	B	Penta Mirror Assembly
601470 *	B	Indexing Assembly, Penta
601472 *	C	Mounting, Plate, Film Looping
601473 *	A	Hanger, Film Looping
601474 *		Shaft Film Drive
601475 *		Spacer Plate
601476 *	A	Hanger
601477 *	B	Hanger
601480 *	A	Drive Clutch Assembly
601481 *	B	Mirror Assembly
601482 *	B	Penta, Mirror Assembly
601483 *	A	Mirror Assembly
601484 *	B	Tiebar
601487 *	C	Nut Hanger
601489 *	E	Bearing Hanger
601491 *	B	Mtg. Yoke
601492 *		Beam Splitter Assembly
601496 *	C	Eyepiece Assembly
601498 *	A	Mtg. Plate
601499 *	B	Y Drive Casting

Project 552 A

*Drawings included in Proj. 552

NUMBER	REVISION LETTER	NAME
601500 *	B	Mtg. Plate
601501 *		Drive Casting
601506	B	Mtg. Angle
601511 *	A	Brake
601514 *	C	Support, Roller
601515	A	Beam Splitter
601517 *	A	Mirror Holder
601518 *	B	Headrest
601520 *	B	Mtg. Plate
601528 *	A	Mirror Mtg.
601529 *		Cover
601530 *	A	Bracket
601557	C	Turret Bearing Support
601561 *	B	Actuator Shaft Assembly
601563 *	A	Ball Screw
601564 *	B	Ball Screw
601566 *	C	Shock Mount Assembly
601568 *	D	Cover Gear Box
601569 *	B	Cover Lamp
601570 *	F	Block
601757-2	C	Objective Lens
601576-1 *	B	Lens, Mount Assembly
601576-2 *	C	Lens, Mount Assembly
601577 *	A	Joy Stick Handle
601578 *	B	Lens Mt. Assembly
601579 *	A	Brake
601586 *	A	Bracket
601587	A	Plate
601593 *	C	Front Plate, Elevating Arm
601594	A	Recept. Hanger
601597 *	B	Rest Plate
601612 *	A	Light House Assembly

*Drawings included in Proj. 552

NUMBER	DIVISION LETTER	NAME
601615 *		Plate, Mounting, Vacuum Assembly
601624 *		Objective Optics
601625	B	Panel Aux. Cabinet, P.S.
601627	A	Panel Aux. Cabinet, (Rear Top)
601628	A	Panel Aux. Cabinet, (Side Right)
601630 *	A	Stepping Motor
601632 *		Bracket Plate
601633 *		Bracket Plate
601634 *		Panel
601635	B	Plate, Left
601637 *	A	Plate, Right
601638 *		Casting, Field Lens Holder
601640		Mirror, Mtg Block
601644		Baffle Plate Side
601645	A	Baffle Plate Top
601647 *		Joy Stick Handle Assembly
601648 *	A	Bearing Block
601650 *	A	Plate
601651	C	Bracket, Terminal Board
601653 *	B	Plate, Connector Bracket
601654 *	B	Mtg. Block Joystick Rotation Counter
601656 *	D	Lamp & Mirror Bracket (Right)
601657 *	D	Lamp & Mirror Bracket (Left)
601658 *		Hinge Bracket (Right)
601659 *	A	Hinge Bracket (Left)
601660 *	C	Mirror Holder (Right)
601661 *	C	Mirror Holder (Left)
601681		Mount Rotapulser "X" Drive
601682 *		Mount Rotapulser "Y" Drive
601692 *		Support "X" Drives
601693 *		Support "Y" Drives
601694 *	A	Bracket, Counter Drive Boards
601699 *	A	Fan Mount Assembly

NUMBER	REVISION LETTER	NAME
601713 *		Cable Support Plate
601714 *		Support Disc. Rot Joy Stick
601715 *		Rt. Angle Sect. Protect Case
601716 *		Circular Sect. Protect. Case
601717 *	A	Plug-In-Osc Assembly
601723 *		Welded Support
601725		Mount Bkt-Incrosyn and Roto "X" Drive
601733		Counter Board Backing
601770		Plate-Switch
601776	A	Assembly TB 1103 & TB 1104
601777 *		Assembly TB 1105 & TB 1106
601791 *		Adjusting Screw & Nut
601792 *		Nut Holder L.H.
601793 *		Nut Holder R.H.
601802 *		Guard Rail
601804 *		Switch Plate
601805 *		Standoff, Switch Plate
601823 *		Lens Link
601824 *	A	Light Shield, R.H.
601844 *	A	Fiber Cable Guide
601846 *	A	Bracket, Filter R.H.
601847 *	A	Bracket, Filter L.H.
601849 *		Cable Guide
601859 *		Adaptor Block, High Sen. Sw. Assembly
601899 *		Front Cover, Top
601983	A	Center Arm Vacuum Holddown
601988 *		Eystation Baffle

Project 552 A

NUMBER	REVISION LETTER	NAME
602372		Clutch & Pulley Assembly
602373		Motor Drive Assembly
602374	A	Mounting Platform
602375		Shutter Mtg. Plate
602430	A	Control Panel Layout
602431	A	Bracket Filter Guide
602513	A	Plate, Bearing
602514		Plate, Motor Mtg.
602541	A	Control Panel
602542	A	Chassis, Relay
602543	A	Housing, Switch
602567		Chassis, P.S.
602569		Plate, Connector
602570		Cabinet Bracket P.S. Chassis
602571		Frame Bracket
602632		Film Switch Assembly
602633		Film Switch Bracket
602634		Actuator, Film
602785		Front Center Film Guide
602786		Rear Center Film Guide
602791		Rear Outer Film Guide
602826		Supplementary Chassis
602846		Relay Bracket
602847		Relay Bracket Support
602853		Cable, Coax.
602910		Wiring Diagram - Film Drive

*Drawings included in Proj. 552

701029 *	E	Roll. Brg. Hang
701032 *	B	Casting BLBS RC
701033 *	D	Bracket, L.B.S. R Cord
701035 *	B	Bracket, Loop Frame F CRT
701036 *	D	Bracket, L.B. Sap. ends
701048 *		Film Loop Drive Gears
701049 *	B	Mounting Plate F.P. & Looping
701056 *	F	Cab. Arm Assembly
701057 *	D	Cab. Arm Assembly
701058 *	C	To date Supply
701066 *	D	X Motion Drive Assembly
701067 *	D	X Motion Drive R. H.
701070 *	A	Casting M.L. & Mirror
701071 *	C	Mount. L. & M. R. H.
701073 *	C	Mount. L. & M. L. H.
701075 *	G	S. P. Assembly Objective Head
701076 *	C	Base Plate
701077 *	E	Plate
701078 *	H	Motor
701082 *	B	Casting Eyepiece
701090 *	F	Mirror Holddown Zoom
701093 *	I	Frame
701095	G	Zoom Magnification
701102*	F	Plate Mg. Enhancer
701105 *	B	Cover, Gen. Box
701107 *	B	Lens, Mtg. Block
701108 *	A	Lens, Block Rear
701109	F	Bracket, Image Enhancer
701114		Cover

*Drawings included in Proj. 552

ITEM NO.	REVISION	DESCRIPTION
701116 *	F	Housing, J.S. Rotating
701119 *	C	Cover
701121 *		L.M. Casting
701122 *	B	Lens, Mtg. Block
701124 *	A	Pipn. Schematic
701125 *		Image Enhancer - LH
701126 *		Img. Enhancer
701128 *	C	Weldment SES
701136 *	B	Shelf
701137 *	A	Back Support Con Shelf
701138 *	A	Cover
701139 *		Side Support
701140	B	Plate, Bottom
701141	B	Bracket
701143 *	A	Arm, Modif.
701144 *	A	Col. Assembly
701145 *	A	Recept.
701147 *	A	Power Pod Disassembly
701150 *	A	Angle, Bracket Console
701151 *		Roller Assembly
701152 *	A	Angle, Bracket, Console
701156 *	B	Arm, Left
701158 *	B	Arm, Right
701160 *	F	2 Speed Trans.
701163 *		Fan Mount. Bkt Assembly
701171 *	B	Front Panel
701173	A	Aux Cabinet Mod.
701176		Plate
701184 *	D	Transformer Assembly
701187	A	Plate
701190	B	Cabinet, Rework

Project 552A

*Drawings included in Proj. 552

NUMBER	REVISION LETTER	NAME
701192 *	C	Field Lens Holder
701201 *	A	Gear Box Linkage Upper
701202 *	A	Gear Box Linkage Lower
701203 *	A	Bracket, Fans
701205 *		Cover, Light Box
701206 *	B	Cover, Film Drive
701207	A	Film Guide
701224 *		Counter Board Assembly
701234 *	A	Mounting Plate - Elect. Comp.
701239 *		Motor Mount
701240 *	C	Terminal Board Assembly
701241 *	C	Terminal Board Assembly
701242 *	C	Terminal Board Assembly
701243 *	C	Terminal Board Assembly
701256 *	A	Cradle Assembly
701257 *	A	Floor
701258	B	Vacuum Platen
701262		System Block Diagram
701275 *		Relay Bracket
701278		Relay Bracket, Cap Group
701296 *		Dial
701337 *		Filter Bracket Assembly
701458		Tube Guide
701464 *		Vacuum Assembly
701663	A	Rotary Shutter Assembly
701738	A	Brake Valve Relay
701744 *		Control Panel Additions
701745	A	Plate, Mounting
701754		Cover
701904		Wiring Diagram - Film Drive

Project 552 A

*Drawings included in Proj. 552

NUMBER	REVISION LETTER	NAME
800405 *	J	Joy Stick Assembly
800432 *	K	Main Frame
800434 *		Image Enhancer Assembly
800435 *	B	Eyeiece Upper Deck Assembly
800438 *	I	Ball Bushing Hanger
800439 *	B	Periscope Assembly
800440 *	I	X Carriage
800441 *	J	Y Carriage
800444 *	R	Light Box Frame
800447 *	D	Eyeiece Assembly
800448 *		X-Y Carriage Assembly
800450 *	H	Console
800453 *	A	Film Drive & Looping
800454 *	C	Objective Head Assembly
800461 *	G	Film Drive Assembly
800462 *	E	Light Box Assembly
800464 *	C	Geneva Housing
800466 *	B	Plate, Mounting, Upper Deck
800469 *	F	Plate Mounting Bracket
800470 *	C	Mounting Plate
800471 *	D	Reticle Projector
800472 *		Reticle and Projector Housing
800476-2		Overall Assembly - 552A
800482	A	Control Panel Assembly (552A)
800485	A	Control Cabinet Assembly
800487 *	B	Dual Joy Stick Assembly
800488-1,2 *	D	Top Cover, Objective
800498	A	Auxiliary Cabinet Assembly
800503-2 *		Superstructure Assembly
800505 *	A	Shelf Assembly
800507 *	A	Cover Elev. Arm
800515 *		Vacuum Assembly
800525	B	Chassis

Project 552A

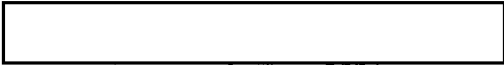
*Drawings included in Proj. 552

NUMBER	REVISION LETTER	
800526	B	Power Supply
800527 *		Vacuum Holddown Assembly
800528 *		Panel
800529 *		Upper Eyepiece Cover
800530 *	B	Lower Eyepiece Cover
800531	B	Control Panel
800532	C	R. F. Shield
800534 *		Support, Eyepiece Link
800537 *		L.H. H.I.L.S.
800538 *	A	Cover, Joy Stick
800551		Wiring Diagram System
800559 *		Mount. and Trans. Y Axis Layout
800856	B	P. A. Assembly
800870	A	W. T. Mod. M. F. D.
800954		Schematic Film Drive

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25X1



Proposal No. 552A

**VERSATILE, HIGH PRECISION
STEREOSCOPIC VIEWER**

Prepared By

25X1



Approved For Release 2004/03/26 : CIA-RDP78B04747A002200010013-3

July 1963

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SECTION 1INTRODUCTION

This proposal describes the modifications proposed by [] to its Model 387 Stereo Viewer in order to fulfill the requirements for ^aversatile, high precision stereoscopic device.

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The above-referenced high magnification stereoscopic viewer was originally developed by [] for the Bureau of Naval Weapons under [] The general description for this viewer is presented at the end of this proposal. In addition, many of the features and techniques described herein have been incorporated into several operational devices produced by [] A partial listing is as follows:

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Model 373 Viewer: This is a stereoscopic viewer for measurement and viewing of dual formats: up to 9½" x 40" each, with magnification of 1x to 30x. Employs Moire fringe readout. Developed and delivered to the U.S. Air Force under [] This system contains an optical switch to reverse eye-station relationship (similar to that proposed here).

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Model 344A Viewer: Similar to the above except that it employs [] digitizers for automatic measurement. Developed and delivered to the U.S. Air Force under []

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Joy Stock Control and Scan Drives. [REDACTED] Model 480: This

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standard joy stock control system is now in use in Model 387 Viewer and Model 527A X-Y Motion Comparator. The latter is an X-Y comparator developed for the U.S. Army Signal Corps TITF Program. More than 5 of these systems have been produced in which a high degree of reliability has been recorded.

General Description:

The proposed viewer shown in Figure 1 allows stereoscopic viewing of roll or cut film transparencies of varying format sizes up to 10" x 20". The observed magnification is continuously variable (in four steps) from 1.5x to 135x. The zoom control of the right and left formats can be independently or simultaneously varied by a motorized drive actuated from the control panel. Scanning is provided for left and right format either independently for overlap control or simultaneously for stereo scan. Variable speed X-axis and Y-axis drives allow continuous control of speed from .0005"/sec. to 1.0"/sec.,

A film takeup loop between the right and left formats is provided that can be controlled from either left format, right format, or kept constant. In addition, two independent film rolls (up to 500' each) can be placed in the viewer so that a frame in one roll can be stereo scanned with another on the second roll.

The viewed images are transmitted through 3/4" square fiber optics flexible cables fitted with Image Enhancers, for increased clarity and resolution. The fiber optics ends can be rotated by +180° to allow independent angular orientation of the right or left formats. The eyepiece end contains provisions for adjustment for maximum operator comfort including interpupillary, up-down, and in-out adjustments.

? 360

Two optical switches are provided within the eyepiece assembly: the first allows the selection of right frame with right eye, left frame with left eye; or, right frame with left eye and left frame with right eye. The second optical switch allows the introduction of a dove prism within the parallel path of the eyepiece so that either or both viewed areas can be reversed. Compensation at the joy stick for the reversal of the image is achieved by an electrical switch, in order to assure correspondence of joy stick motion to the viewed image. The joy stick is located within a rotatable mount so that it can be adjusted to correspond to the orientation of the fiber cable.

A projected reticle is provided that can be varied in diameter to be observed as 1' to 4' of arc at any magnification.

[REDACTED]

In order to assure that the system is least sensitive to vibration, it is supplied on 4 vibration isolators. The selection of the isolators is based on the vibration frequency and amplitudes expected at the operational site.

The structure supporting the carriages is rigidized to assure the capability of at least 600 lines/mm at the film plane. The system used is [REDACTED] Model "387" viewer, which has shown the capability of at least 400 lines/mm (at 50x magnification). Further magnification to 125x, and the additional rigidity assures that a minimum of 600 lines/mm can be achieved.

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SECTION 2

OPTICAL SYSTEM DESCRIPTION

Figures 2 and 3 are the optical schematics for the High Magnification Viewer. The optical system has four overlapping ranges of object magnification infinitely variable between their limits: A. 1.5x to 6.4x with 0.36x objective, B. 4.2x to 18x with 1x objective lens, C. 10.5x to 45x with 2.5x objective lens, and D. 31.5x to 135x with 7.5x objective lens. This is achieved by using a fixed 6x eyepiece. A zoom lens system provides the infinitely variable magnification (0.7x to 3x). The objective lenses are extremely high resolution microscope objectives made by Leitz. The resolving power of the 7.5x objective exceeds 1,000 lines/mm due to its numerical aperture, and its design being close to diffraction limited optics. The image information from the objective assembly is relayed to the eyepiece assembly by use of fiber optics cable. A flexible coherent bundle contains glass fibers .0004" diameter that permit image rotation and positioning of the eyepieces over a wide range without a complex conventional optical system.

High Intensity Light Source (Figure 7):

A high intensity light supplies variable illumination for the viewing optics. It is located on an arm attached to the vertical support of the objective assembly, and, therefore, tracks the viewed area on the film. A G.E. #1594 lamp is used. In order to assure that the numerical aperture of the objectives are filled with light, the lower surface of the glass plate is a diffusing ground glass surface.

To prevent overheating dense portions on film, the high intensity light source is fitted with one (1) heat reflecting filter immediately in front of the lamp and two (2) heat absorbing filters at the condenser's output. The filters as well as the condenser lenses are in a cylindrical assembly that may be moved axially for adjustment of spot size at the ground glass surface of the support plate. The lamp is easily removed through the access opening in the cabinet sides after the fluorescent lamp assemblies are removed. The socket used for the lamp is an improved prefocused version that assures high reliability of contact after extensive usage.

25X1 Either one of the objective lenses, 0.36x, 1x, 2.5x, or 7.5x may be selected by a switch on the control panel; the chosen lens is then electrically driven into place on the optical axis. The three lenses are located on a turret similar to that used on Models 344A and 373 Viewers. The objective lens provides an image of fixed magnification that is relayed to the fiber cable by a variable focal length lens system. The zoom magnifier offers infinitely variable magnification between .7x and 3x in addition to the objective lens. The zoom magnifier is manually or electrically driven, being controlled by a switch at the control panel or a knob on the objective assembly. A dial indicates magnification of the zoom lens system. Separate electrical controls are provided for the right and left formats. In addition, another switch enables simultaneous variation of both formats.

A field lens at the image plane formed by the objective lens assures full objective lens field coverage by the zoom magnifier and a uniform bright field making full use of the objective lens aperture.

for all mag.

Each objective lens is mounted in a threaded sleeve so that precise focusing can be made especially for the 2.5x and 7.5x lenses where maximum resolving power is required for the high magnification range.

Since the eyepiece power is fixed at 6x, system magnification will be the product of objective lens, zoom magnifier and eyepiece magnification. A separate section of this proposal describes the optical switches at the eyepiece assembly.

The image enhancer scanning optics are located at either end of the fiber cable and scans image points over many fibers. Because there may be imperfections in the fiber structure, such as broken fibers, the image scanning technique integrates the image brightness as seen through the transmitting and opaque areas of the cable in the scan circle. The image enhancing motor and mechanisms are shock mounted in order to minimize possible vibrations. In addition, sound-proofing techniques will be used to eliminate the noise being transmitted to the operator. All covers and inner structure of the supports of the image enhancers will be covered with sound-proofing foam to dampen audible noise.

To assure that input and output scanning motions track each other for maximum image information, a phasing operation is required. Here, phase shifting is effected between corresponding enhancer motors electrically for small fine positioning (approximately 5°), and mechanically by stator rotation for larger phasing adjustment. A constant voltage A.C. power supply is

provided in order to assure that the phase setting is fixed independent of large variation of the input voltage to the viewer optical switches.

The eyepiece assembly supports the fiber cable ends, the eyepieces and the enhancer motors. The assembly is in two halves corresponding to right and left channels and are hinged to provide the interocular distance adjustment. The eyepieces are mounted in a threaded sleeve permitting independent focus adjustment to suit the operator's vision. A headrest is provided having a small adjustment range for viewing comfort. The entire eyepiece assembly can be positioned through a range of vertical, front-to-back and angular positions to suit many operator statures and viewing positions. The motion of the eyepiece assembly is identical to that provided in Model 307 "laser: "3" up or down, 13" back and forth, and 0 to 30° angular displacement. Interpupillary distance is adjustable 2-1/4" to 3". Exit pupil is 9mm.

General Illumination:-

General illumination is achieved by a bank of fluorescent fixtures (as shown in Figure 8). This type of light fixture is interchangeable with cold light sources already provided to [] for X-Y Motion Comparators (Signal Corps TIK program). The latter type is a cold cathode which is variable in illumination from 50 to 1,000 foot-lamberts. The cost of the fluorescent type fixtures to that of the cold cathode system is approximately the same. Consequently, the cognizant government agency can select either of the alternatives.

Eye-piece Assembly:-

The eyepiece assembly includes all the optical switches required for the system. It contains relay lenses which collimate the images from the fiber cables. Parallel light is then provided at the optical switches, so that no focusing is required, as the optical switches are actuated. This system is very similar to the optical switcher developed by [] for Model 373 Viewer, except that it is folded to result in a small compact package.

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Figure 3 illustrates the optical schematic. As shown, the right fiber cable's exit image is first passed through the image enhancer, onto the mirror M1 which directs it upward. M1 is a collimating lens of 7" focal length of high resolution, being the same as that used for Model 373 Viewer. The collimated beam is then passed through the first optical switch which contains a dove prism. This prism bends the light onto the long surface of the prism, which causes it to encounter a single reflection. Consequently, it acts like a single mirror, with the exit beam being in line with the entrance beam. This prism may be placed in order to reverse right to left orientation on film (negative to positive or vice versa). It can be inserted into the path or removed from the path by a knob located externally at the eyepiece assembly. A similar prism is located at the left cable to achieve independent reversal of right or left channels.

The exit illumination from the dove prism is directed to M2, to M3, and down to the lens L2; L2 is selected to be identical to L1 so that a 1:1 image

is formed at the focal plane of the 6x eyepiece. In this manner, maximum resolution and minimum distortion is achieved. L2 forms the image of the fiber cable behind the eyepiece after reflecting at M4.

The left fiber cable imaging system is identical to the right. The lower portion of Figure 3 illustrates stereo viewing where the right eye observes the right image and the left eye observes the left image. An optical switch is provided by rotating the mirrors M1, M3, M5 and M6 as shown in the upper figure of Figure 3. In this manner, the right fiber optics image is transmitted through L2 onto M6 and onto the left eyepiece. The left fiber cable image is transmitted through M5 to M3 and then onto the right eyepiece.

Fiber Optics Cable:-

In order to achieve a large field of view at the eye a 3/4" x 3/4" flexible fiber optics cable will be used having 10 micron fibers. The resolution obtained by utilizing the image enhancer is better than 60 lines/mm at the fiber cable. A 6x eyepiece will be used so that the resultant field of view is twice in diameter to the 3/7 viewer which utilized a 1/2" cable and 4.45x eyepiece.

Reticule Dot:-

The reticule system is shown in Figure 2. It is located at the objective assembly between the objective lens and the zoom optics. A small filament source and condensing optics constitute the illumination of the projected dot.

The dot is formed as the illumination exiting from an iris diaphragm through a relay minification lens. The iris diaphragm contains over 10 blades, so that a circle is formed within the opening of the blades. The advantages of utilizing an iris are many, among which is the variation of diameter by 30 to 1, the maintenance of focus independent of size, and that the center of the iris is maintained fixed independent of its aperture. Manual control of the iris is provided by an external knob. An optional feature is described separately, whereby the size of the iris is automatically varied to compensate for zoom magnification.

The subtended angle of the reticle to the eye is from 4' to 1' minimum at all magnifications. Continuously variable illumination of the dot is provided at the control panel.

Film Hold-down System:

In order to achieve maximum resolution and flatness, vacuum hold-down is used. The lower plate contains $\frac{1}{2}$ " thick glass which is polished to better than one wavelength of green light. The upper plate contains a groove system subcontracted to [REDACTED]. Adjustment screws are provided around this plate so that the space between the objective and glass is maintained fixed to better than .0004". In order to select the utilization of 35mm, 70mm, 5" x 9" film a hinged cover is adjusted to cover the area that is not used so that vacuum can be assured. A vacuum pump is provided, manufactured by [REDACTED]

[] Solenoid valves are supplied to automatically remove vacuum
prior to film advance. Separate vacuum control is achieved on the two separate
plates each covering more than 10" x 20" area.

Position Indexing System:

Four (4) reversible counters are provided near the eyepiece assembly to
define X and Y axis of the carriages in the right and left frames. Each count
represents 1mm. The counters are resettable to zero. The sensor is geared to
the ball screw drives. Each counter has three numbers. A cable will be provided
so that the location of the counters may be remotely located at the discretion
of the operator.

SECTION 3MECHANICAL DESCRIPTIONScan Drives.

"To position the objective lenses over the format area a scanning drive with X and Y carriages are independently positioned by an infinitely variable two-range stepping motor powered drives." A joy stick at the control panel provides two axis scan direction and velocity control is fitted with necessary switches for speed range selection and channel activation. With this arrangement one-hand control is possible for rapid and precise positioning of the carriages. Figure 10 is a photograph of the scan drive mechanism (Model 337 Viewer); Figure 11 is the schematic of the scan drive showing the relationship of the components used. A detailed description of the drive is provided at a separate section of this proposal.

The two joy stick mechanisms described separately are located within a rotatable mount that can be oriented continuously to $\pm 180^\circ$ by a self-locking tangent screw drive. Dials are provided at the joy stick to indicate orientation. In addition, the orientation of the fiber optics cable (image orientation) is also indicated by an associated dial; in this manner, the operator may set the orientation of the joy stick assembly to correspond to the image rotation, so that moving the joy stick up moves the image up (as observed at the eyepiece). In addition to the above, a reversing switch is located at the control panel to allow correspondence to the negative-to-positive optical switch. The purpose of this switch is to reverse the direction of the X-axis motor. This motor would then effect a mechanical direction reversal in correspondence with the optical reversal allowing correspondence of joy stick motion to optical

orientation at any position of the optical switch.

Either left, right, or both channels can be operated at the joy stick by a switch mounted at the control panel. This control electrically disconnects the channel that is desired to be fixed, or allows both channels to be moved in unison for stereo viewing with a constant center distance between objective lenses. By disconnecting either channel overlap can be quickly altered. It can then be fixed by centralizing channel selector switch, at which the joy stick will move both channels simultaneously.

Ball screws position the X and Y carriages with little backlash and resistance. Since all wearing surfaces are hardened, little loss in the screw's precision with use is expected. Backlash is controlled by two ball nuts mounted back-to-back in the threaded mount so that minimum backlash can be easily obtained by relative motion between nuts and thread. Axial motion of screw is restrained by a preloaded pair of ball bearings at the magnetic clutch coupling. The screw's outboard end is radially supported by a ball bearing that can float axially accepting changes in screw length without restraint.

The carriage guides for both axes are rods and ball bushings made with hardened and ground surfaces. Alignment and axis relationship are maintained continuous supports on the cast frame and carriages.

The support frame is a heavy casting stress relieved and precision ground on the mounting surfaces. Supports at each corner mount the frame mass directly on the floor with leveling jacks. Adjustment of $3" \pm 1"$, as measured from cabinet's bottom surface to floor, is provided by the jack screws. A lock nut on each screw will secure the leveling adjustment. In addition, vibration isolators are provided as shown in Figure 1.

Light Box.

The means for holding and transporting the film and providing general illumination is arranged in the light box assembly. This mechanism is rigidly supported by the frame so that the film is held steady during viewing.

To guide negative or positive film into and out of viewing area, there are two pairs of polished free-turning rollers installed between the pressure plates and spools. The upper roller is hinged at the rear so that film loading between rollers is simplified.

Motorized Drive

In certain applications it may be desirable to simultaneously scan a stereo pair where the scale of one frame is not the same as the other. Consequently, it is desirable to stereo scan one frame at a different rate than the other. Thus, if the scale of Frame A requires a magnification twice that of Frame B in order to achieve the same image size to the eye, then the object size of Frame A is half that of B. Therefore, the speed of scan in A must be half that of B to assure correspondence in the stereo scan mode.

In addition to the above, another possibility exists where the Frame A is photographed at slightly different angular orientation to B. Consequently, the carriage drives for A must scan in a different direction from that of B.

This Feature provides for simultaneous scanning of Frame A and Frame B with compensation to allow for: (1) different orientation; (2) different magnifications.

This is achieved by using step motors, which are driven by pulse generators, see Figures 12 and 13. The speeds of the drives are proportional to the repetition rate of the pulses which are in turn controlled by two joy stick mechanisms. A single stick is mechanically connected to each of the two X-Y motion control joy stick mechanisms. One joy stick mechanism controls the right scan, and the other mechanism controls the left scan; left, right or stereo mode being preset through a selector switch. To insure image and carriage motion correspondence the right and left joy stick mechanisms are mounted on rotatable mounts that can be independently oriented to $\pm 180^\circ$ in order to independently match any cable angular displacement. Thus, the right mechanism is manually rotated to follow up the right channel optical orientation determined by the rotation of the right fiber optical cable. The left control mechanism is rotated to correspond to the left cable orientation. Easily observable indicator dials are located at the cable and joy stick, so that quick correspondence can be made.

To permit stereo scanning for differing magnifications, the X and Y carriage scanning speeds are automatically adjusted to compensate for non-matching magnifications in the left and right channels. To accomplish this, potentiometers are linked to the zoom optics which provide a speed increase or decrease of the right scan drive to correspond to its magnification; also, the left scan speed will be adjusted to correspond to the left channel magnification. In this manner, proper stereo scanning can be maintained independent of orientation and magnification

—
—
— differences of stereo pairs.

—
—
— A selector switch allows for bypassing the magnification
— feedback; in addition, it is also possible to select a synchronized
— mode where the left carriage moves exactly in the same speed and
— direction as that of the right. This is simply achieved by having
— the same pulse generator control the right and left frames. No
— accumulation of errors can develop, independent of the number of
— starts and stops, due to the positive action of the stepping motor.

—
—
— This feature enhances the overall system operation by
— providing faster photo interpretation while assuring maximum ease
— of operation with minimum operator fatigue.

DESCRIPTION

Figure 12 illustrates the pulse generation for speed control, while Figure 13 illustrates the general block diagram of the drives.

Figure 12 shows only the X axis control, the Y-axis being the same as the X-axis. An X_1 -axis potentiometer control is provided at the right joy stick mechanism. The voltage developed at the center arm of the potentiometer is proportional to the angular displacement of the joy stick, and its angular orientation. This output is then applied to a potentiometer which is geared to the zoom control drive. Consequently, the output from the zoom potentiometer is inversely proportional to the zoom magnification. This voltage is applied to a pulse generator such that the repetition rate of the pulse generator is proportional to this input voltage. Each pulse represents a single step of the stepping motor. The repetition rate determines the speed of the carriage.

The pulse generator, controller and step motors are standard motors and electronic transistorized packages available from

The switch S1 can bypass the zoom potentiometer so that the output speed can only be dependent on the joy stick angular displacement. This switch is located on the control panel. In addition, selector switch S2 is provided to achieve any of the following controls:

1. Left carriage is actuated by the left joy stick, while the right carriage is completely de-energized.
2. Left carriage is controlled by the left joy stick while the right carriage is controlled by the right joy stick mechanism. The right joy stick mechanisms are linked to the left joy stick mechanically so that only one stick controls both mechanisms. This allows the right mechanisms' servo angular orientation to be independent of the left. Thus, the actual motion of the left carriage may be different in magnitude and orientation. However, the resultant displacement as apparent to the eye, would be identical for the right and left channel, as long as the scale and orientation of both frames does not change within the same viewed area.

- [REDACTED]
3. Both left, and right carriages are controlled identically by the left joy stick. This mode of operation is possible when left and right frames are the same in scale and orientation. Consequently, perfect synchronisms can be achieved since the same pulse generator is used for both left and right frames.
 4. Right carriage is controlled by the right joy stick mechanisms; the left carriage and joy stick mechanism are de-energized.

The joy stick mechanisms are identical to those used by [REDACTED] in Model 387 Viewer and in X-Y tables developed for the U. S. Army TIIF Program. The linkage interconnecting the mechanisms is a pantograph type motion to assure correspondence in the X and Y axes of the two joy sticks, maintaining an independent orientation by a ball type pivot at the joy stick mechanisms.

Each step motor drives in one of two speeds: Fine - to achieve .0001" to .030" sec. through a gear train N1. The coarse drive is achieved by energizing a duplex clutch to allow the same motor to drive through gear train N2. In this manner a total variable speed of .010" to 1.0"/sec. is achieved. A selector

switch at the joy stick allows selection of coarse and fine speeds. In addition, a jog switch is available at the top of the joy stick *not provided* to allow step motion by approximately 1 micron per step. An alternate to the jog switch is a rotatable switch located at the handle of the joy stick to allow selection of fast, medium, and very slow speeds. The slowest speed is approximately 3 microns per second. The operator merely rotates the handle clockwise or counter-clockwise to achieve the selection of one of 3 speed ranges.

RIGIDIZED CASTING SUPPORT FOR FUTURE MEASUREMENT CAPABILITY

A highly stable rigidized casting is provided for the support of X and Y carriages. The X and Y axes rods are supported from below continuously by precision ground supports continuously across their length in order to assure maximum stability with extensive usage and time.

Space will be provided for future utilization of Moire Fringe gratings made by for automatic visual readout or storage into punched tape or card.

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The change of design of the 387 system is not extensive due to this feature. It essentially changes the configuration of the lower support of the carriages and rod supports.

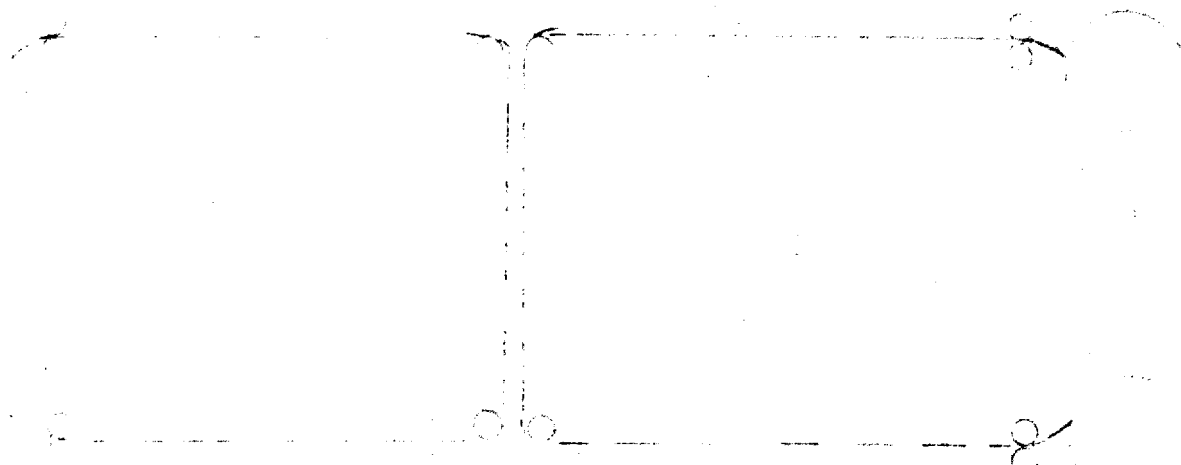
Movable Control Console.

The control console is provided within a separate box with a 6-foot interconnecting electrical cable to the main body of the viewer. The size of this package is 9" deep by 16" wide by 6" high approximately. It can be located at any position relative to the viewer (right, or left, or a few feet away from the viewer). Spring loaded or snap-on cable holders are provided within the viewer to allow the take-up of extra cable. Supports are provided at the right and left sides for positioning of the console to the right or left side of the operator. The console contains a connector at the back for interconnection to the viewer so that it is a separate portable package.

The exact size and configuration of the control console shall be determined after a human engineering analysis to assure minimum size within the functional requirement, and providing identification of all components by feel. The writing shelf will be modified for positioning the control at the right or left.

Four (4) film spools are provided: two on the right, one above the other, to handle the drive of one film for widths of 35mm up to 9½", and two on the left for a second similar roll. The capacity of the spools at either side is up to 500 feet.

To load two rolls, one on the right, the other on the left: insert the film spools on the top right and left. Then, extend the film from the right film roll between the guide rollers to the center of the viewer and attach it on a clip at the center roller. Next, extend the end of the left film roll onto the central roller and attach it to a second clip on the central roller, as shown below:



Next, push the loop forming switch. The rollers would automatically go down onto the path shown dotted above until rollers stop next to the sides of the viewer. The operator then merely holds the ends of each film and attaches it to the correspondent empty spools.

The above automatic threading system is simply accomplished by using the loop forming mechanisms already provided within the viewer. It has the advantage of simplicity, requiring no additional mechanisms. The film loading procedure may be accomplished either by automatically threading both film rolls at the same time or loading the right film first, then returning the loop forming rollers up by the motorized drive, after which the left roll may be loaded.

To load one film roll to view adjacent frames, simply place the supply and takeup at the upper right and upper left spool holders, laying the film flat across both right and left viewing areas. " In this mode, the loop forming mechanism can be used to form a loop up to 14 feet as described in a separate section of this proposal."

fixed free-turning rollers that form a slot and protect the film during the loop forming operation. As the moving rollers travel downward the loop length increases. At the "knee" of the chain circuit the pair of moving rollers separate and begin to travel in opposite directions enlarging the loop into an inverted "T" as in Figure 9. The limit is reached when moving rollers reach the end sprockets where the loop forming drive motor is shut off by a limit switch. Free-turning fixed rollers support and protect the film as it turns from vertical to horizontal paths at the "T" (idler roller in Figure 9) and midway under the long span between the limit sprockets.

To retract or withdraw the film loop, rotate the film winding handle of the selected channel as to be turned to wind film on the spool. The opposite spool will be braked by a magnetic brake on the opposite film drive. Tension in the film will return the forming rollers on the path they took in forming the loop. If desired, the withdrawal process may be stopped at any point in order to return to viewing of the film strip.

An electrical interlock between the vacuum and film transport or loop forming operation is made so that a solenoid actuated valve removes the vacuum during manual film drive or loop forming mode.

Not the case

Loop forming Mechanism (Identical to Model 387 Viewer). (Figure 9.)

As a part of the film handling facility in this instrument a film loop can be formed between the adjacent viewing areas containing as much as 14 feet of film (center of right format to center of left format). Controls for the loop forming mechanism are located on the control panel and consist of a mode selector switch and a pushbutton. The modes of operation are essentially loop forming, holding a fixed loop length and loop withdrawal. Except for loop withdrawal, all functions are electrically driven or actuated. Manual withdrawal of loop is performed by rewinding film onto either of the spools with the choice up to the operator. The mode selector switch will direct the mechanism from which channel the film is to be withdrawn for the loop. Once the channel is selected, a choice to use the "Manual Withdraw" or "Lock" modes can be made. A loop may be formed in either position; the purpose of the choice will be whether the operator wishes to form and withdraw the loop or to form and hold the loop, respectively. The mode selector may be moved after the loop has been formed to any position, if the operator decides to change withdrawal from the other channel or wishes to disband or change length of loop held in storage.

The loop forming mechanism consists of a pair of rollers attached to parallel chain circuits that are coupled by interconnected sprockets. When not forming a loop the rollers are above the film plane between the viewing areas as seen in Figure 4. In operation, after the pressure plate is raised, the lower roller of the pair makes contact with the film drawing it between two

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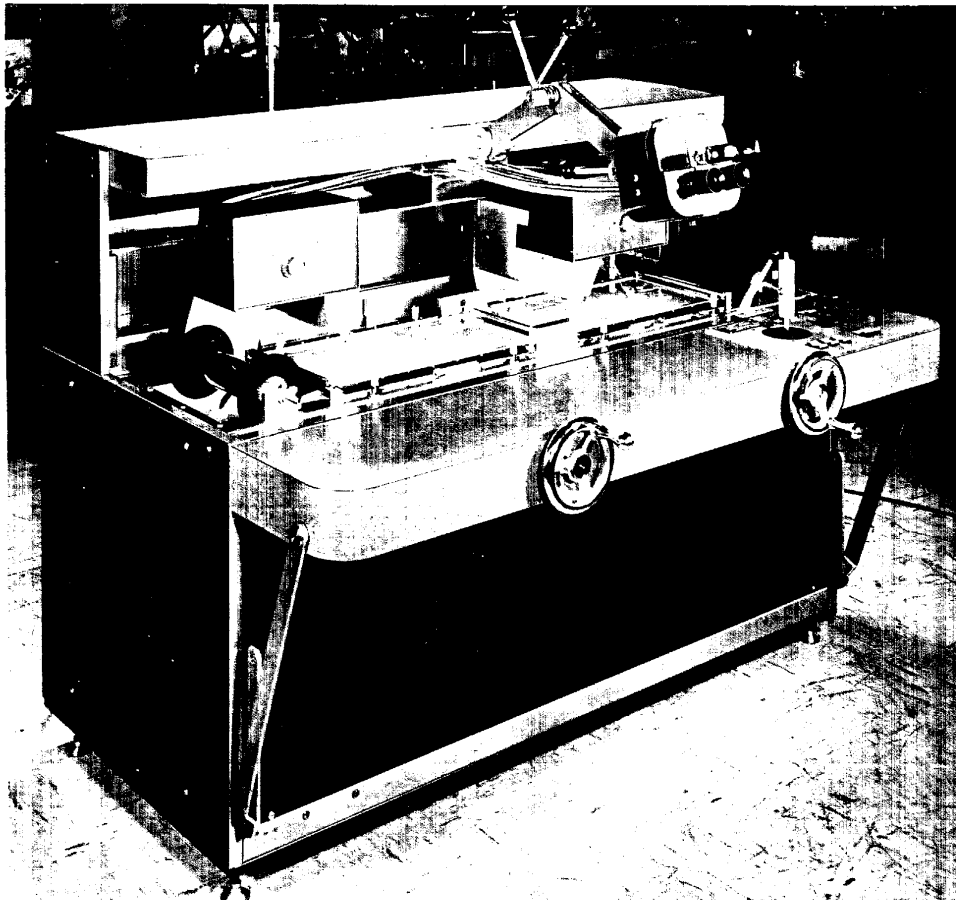


Figure 4.
Overall View High Magnification Viewer.

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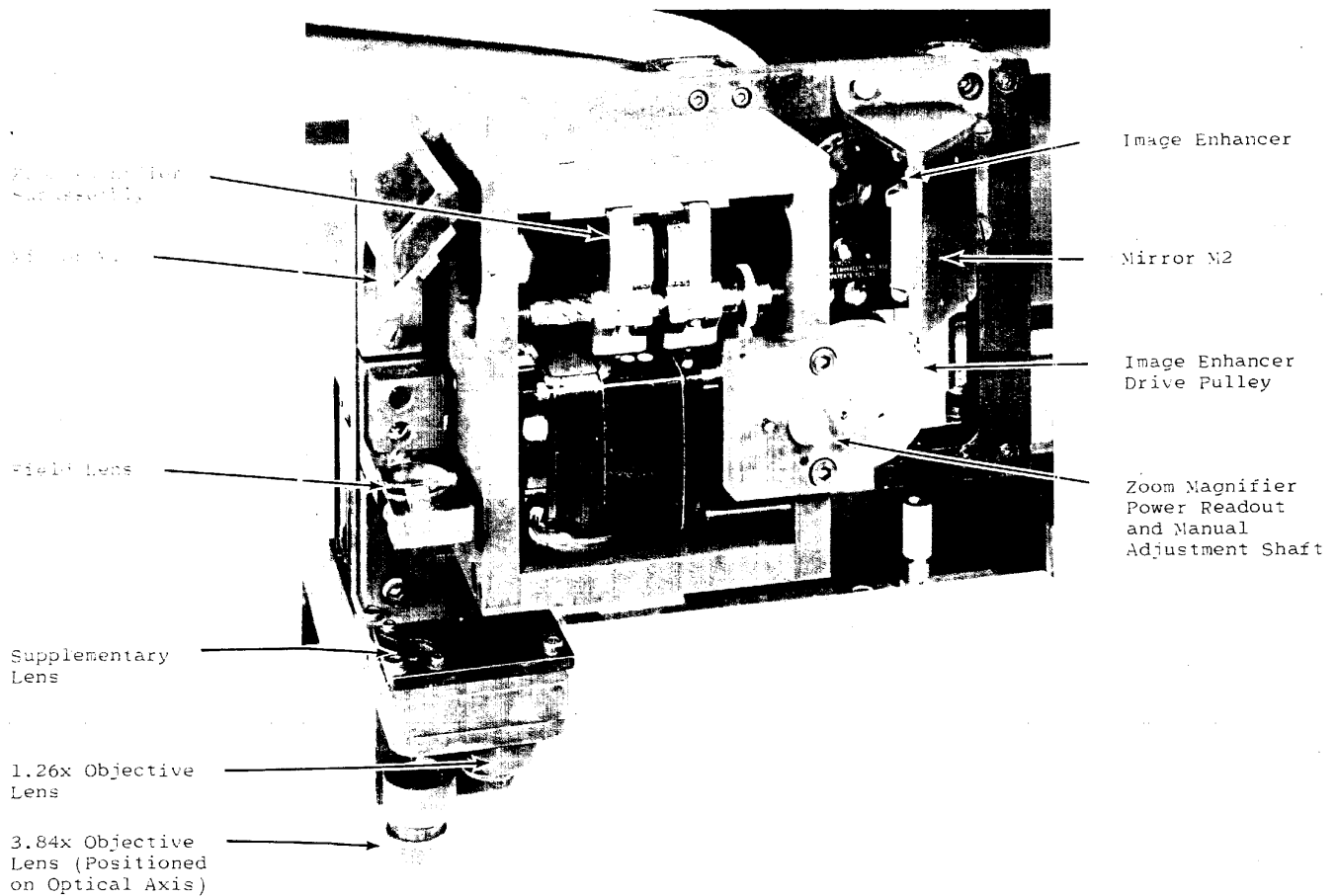


Figure 5.

Objective Assembly (Right Channel) With Covers Removed.
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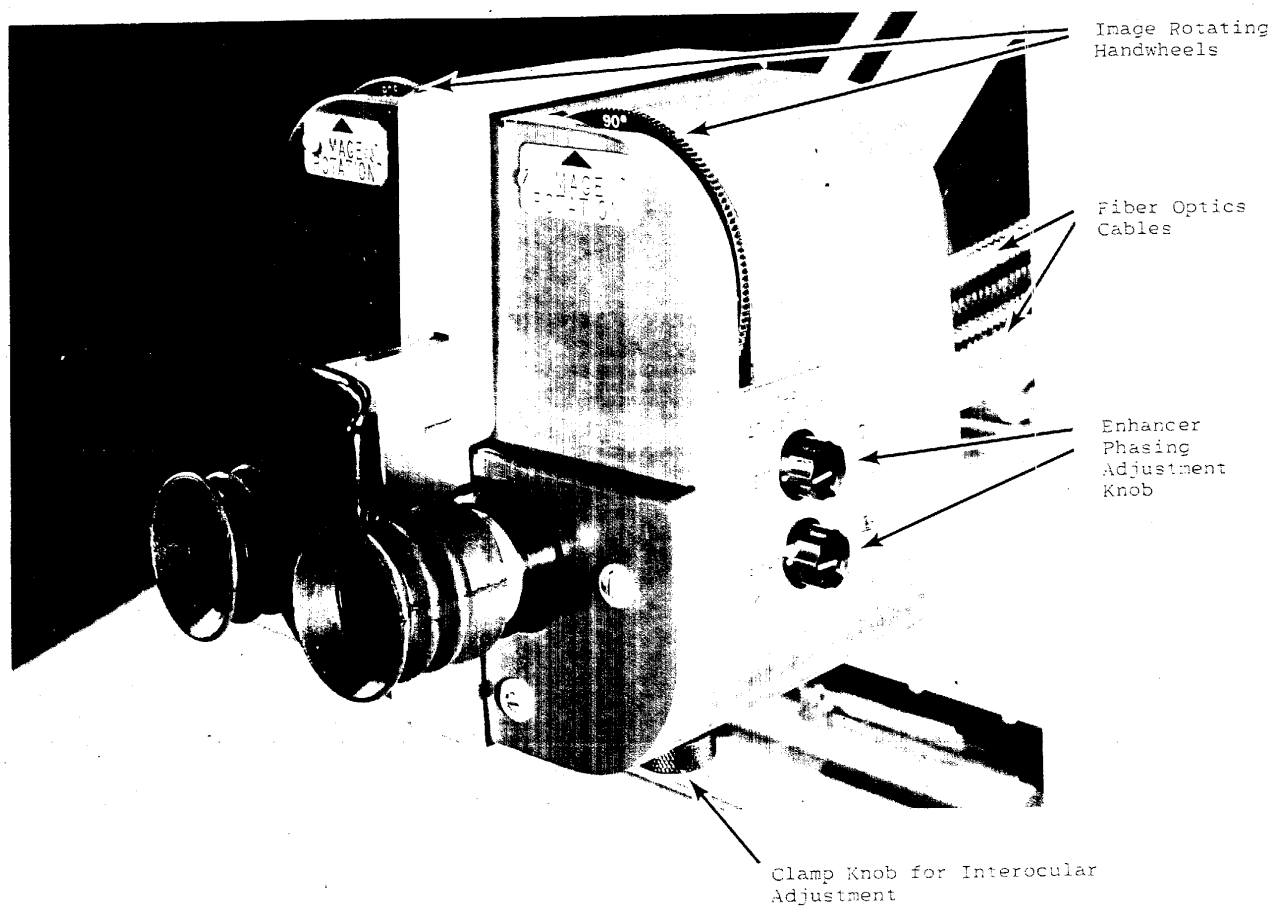


Figure 6.

Eyepiece Assembly for High Magnification Viewer.

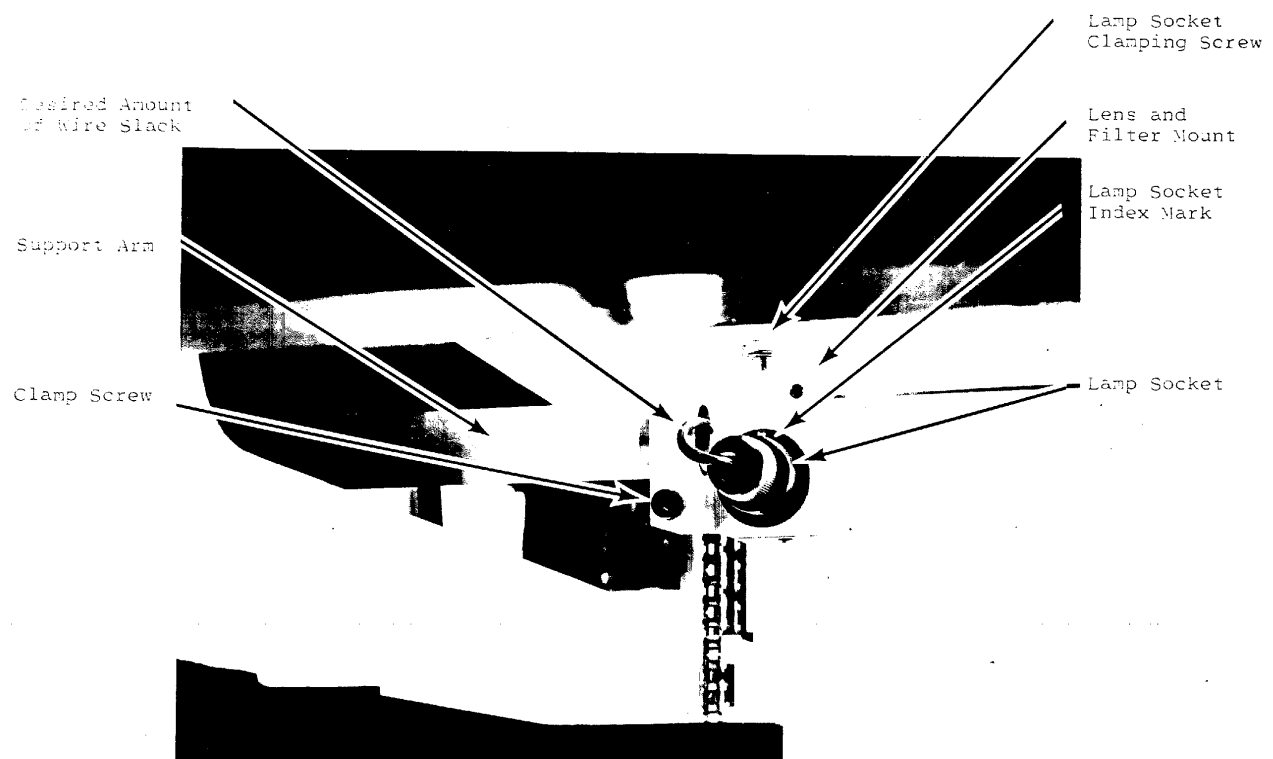


Figure 7.

Left Channel High Intensity Light Source as Seen Through
Access Opening on Cabinet's Left Side.

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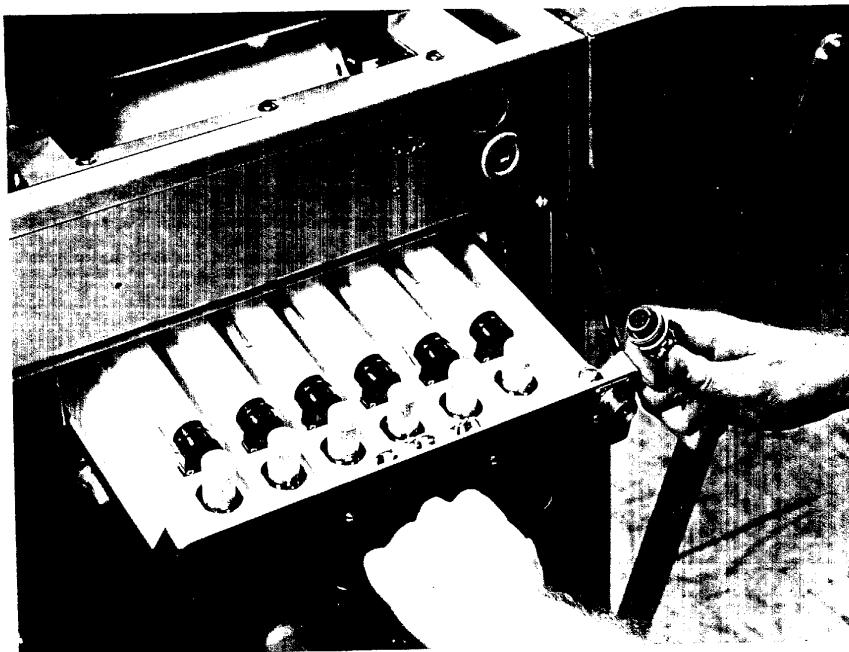


Figure 8.

Fluorescent Lamp Assembly (Left Channel Shown) Partially Removed
From Cabinet Showing Extraction Means and Connector.

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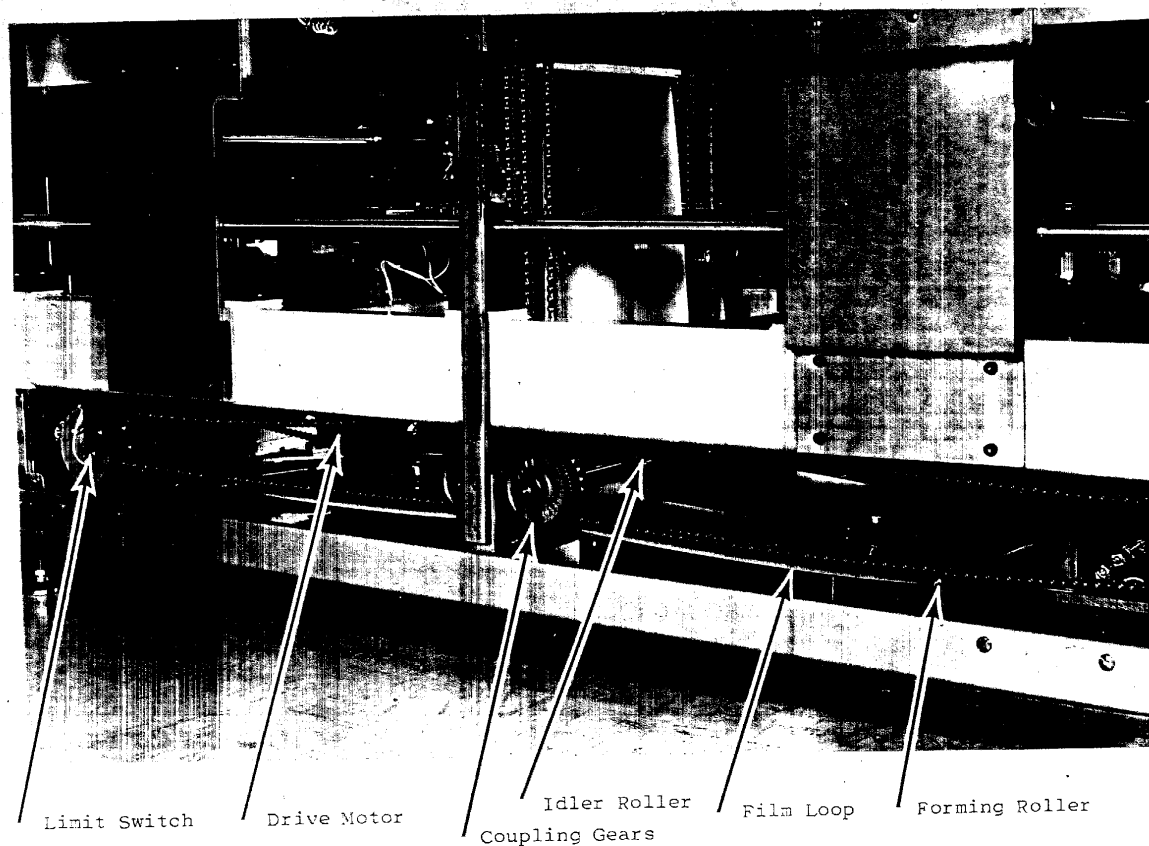


Figure 9.

Front View of Loop Forming Mechanism Containing Film
and Shown with Approximately 7 Feet of Film in Loop.
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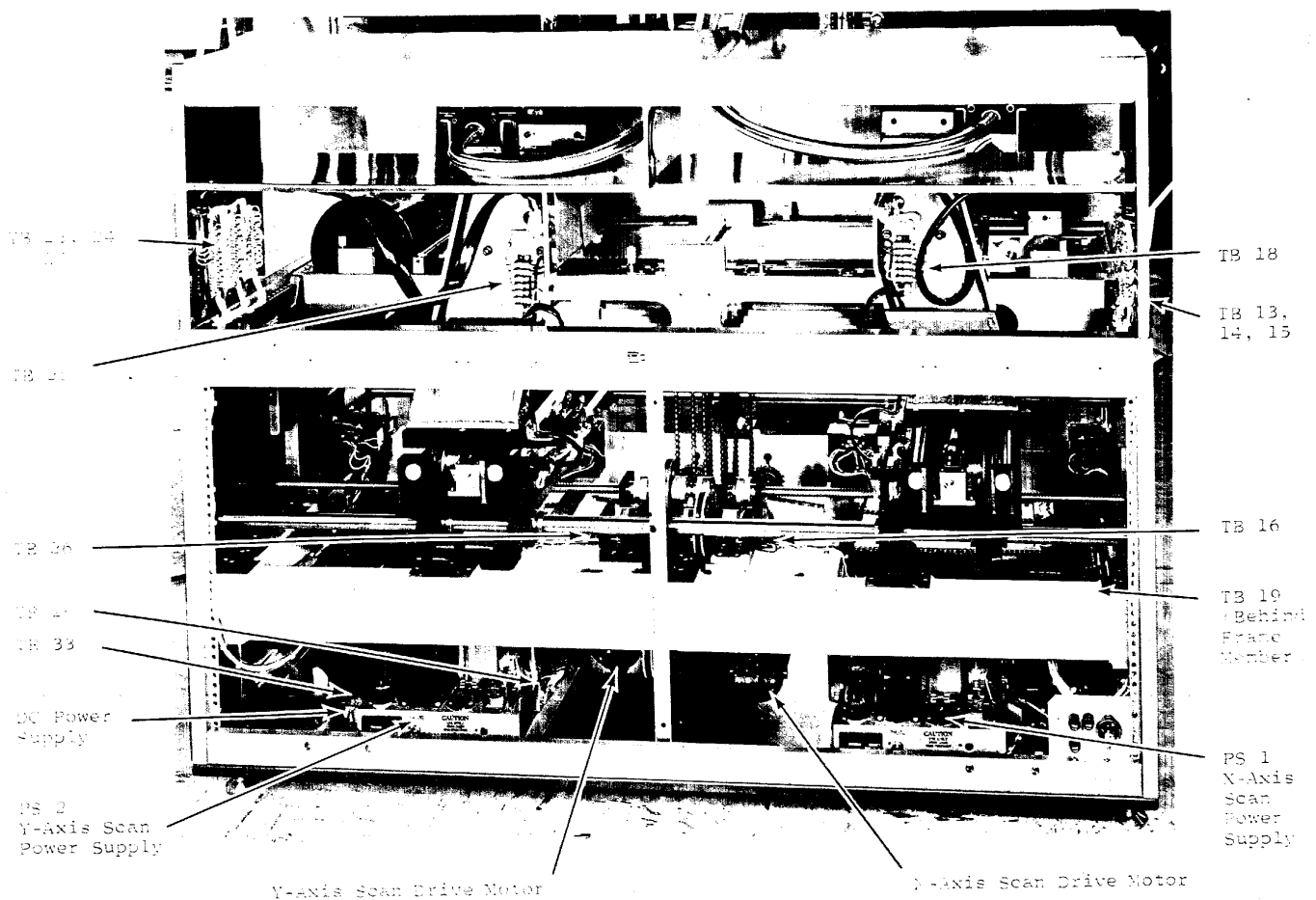


Figure 10.

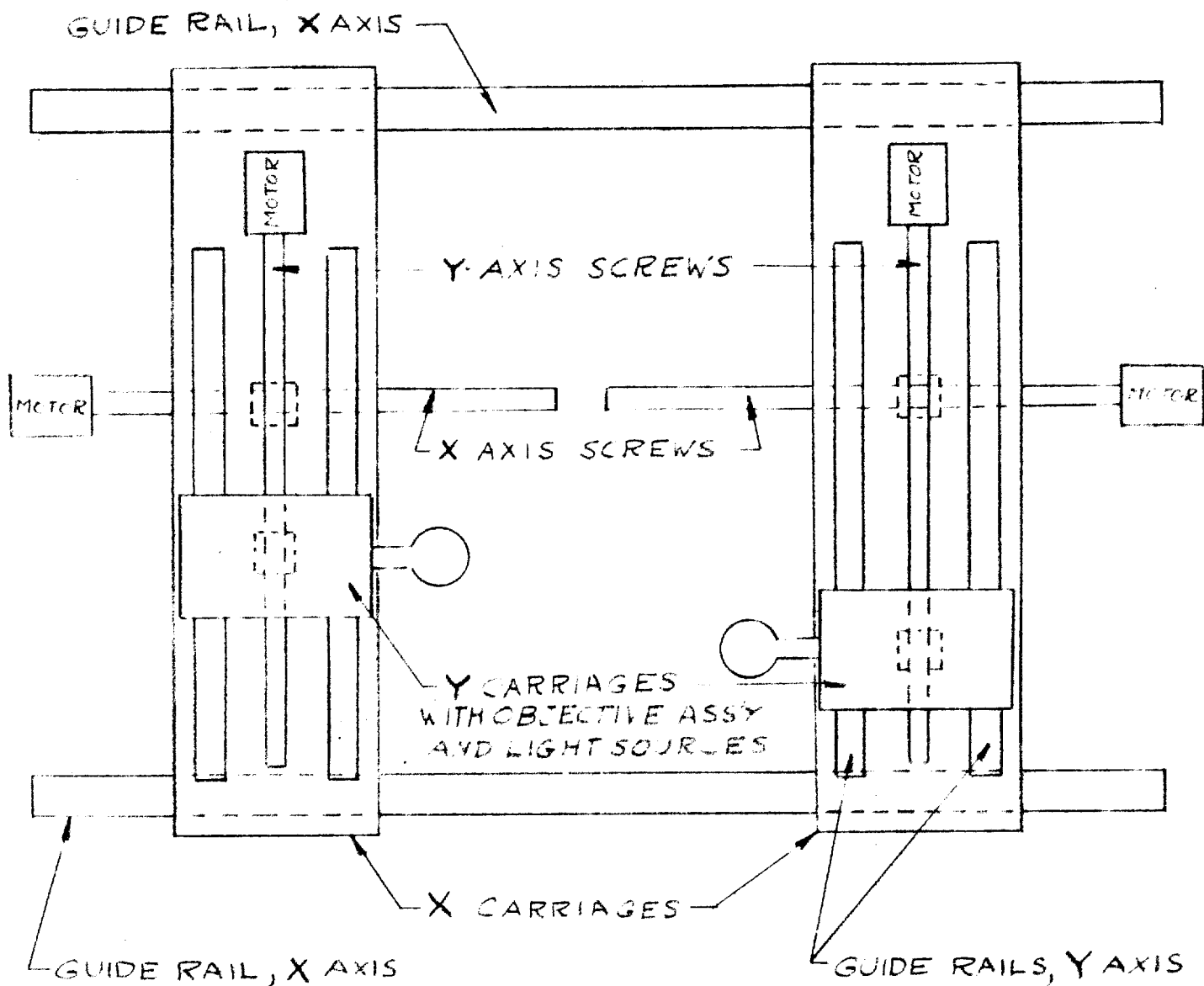


FIGURE II

SCANNING DRIVE SCHEMATIC

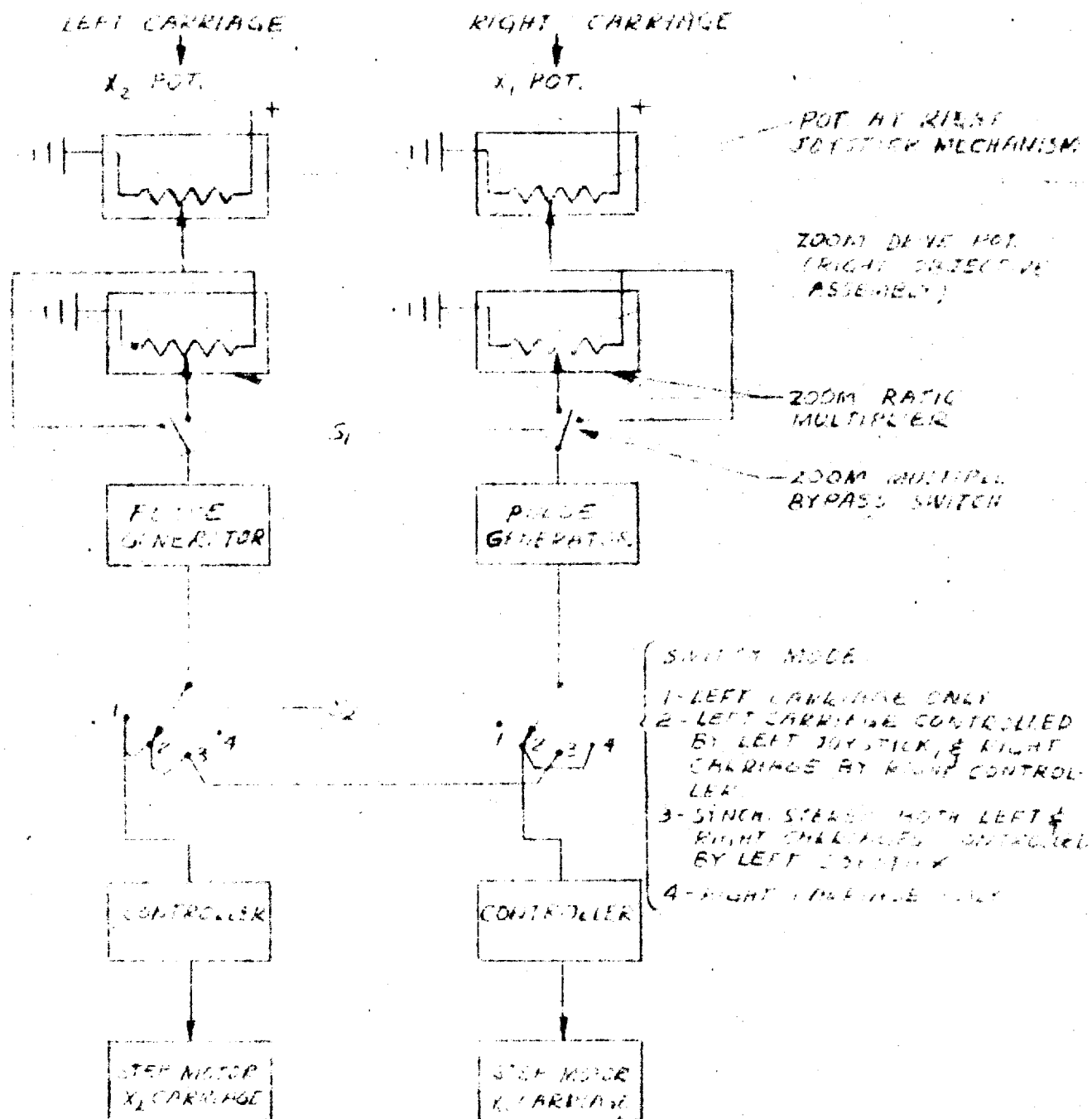


FIG 12
X-AXIS CONTROL
(Y-AXIS SAME AS ABOVE)

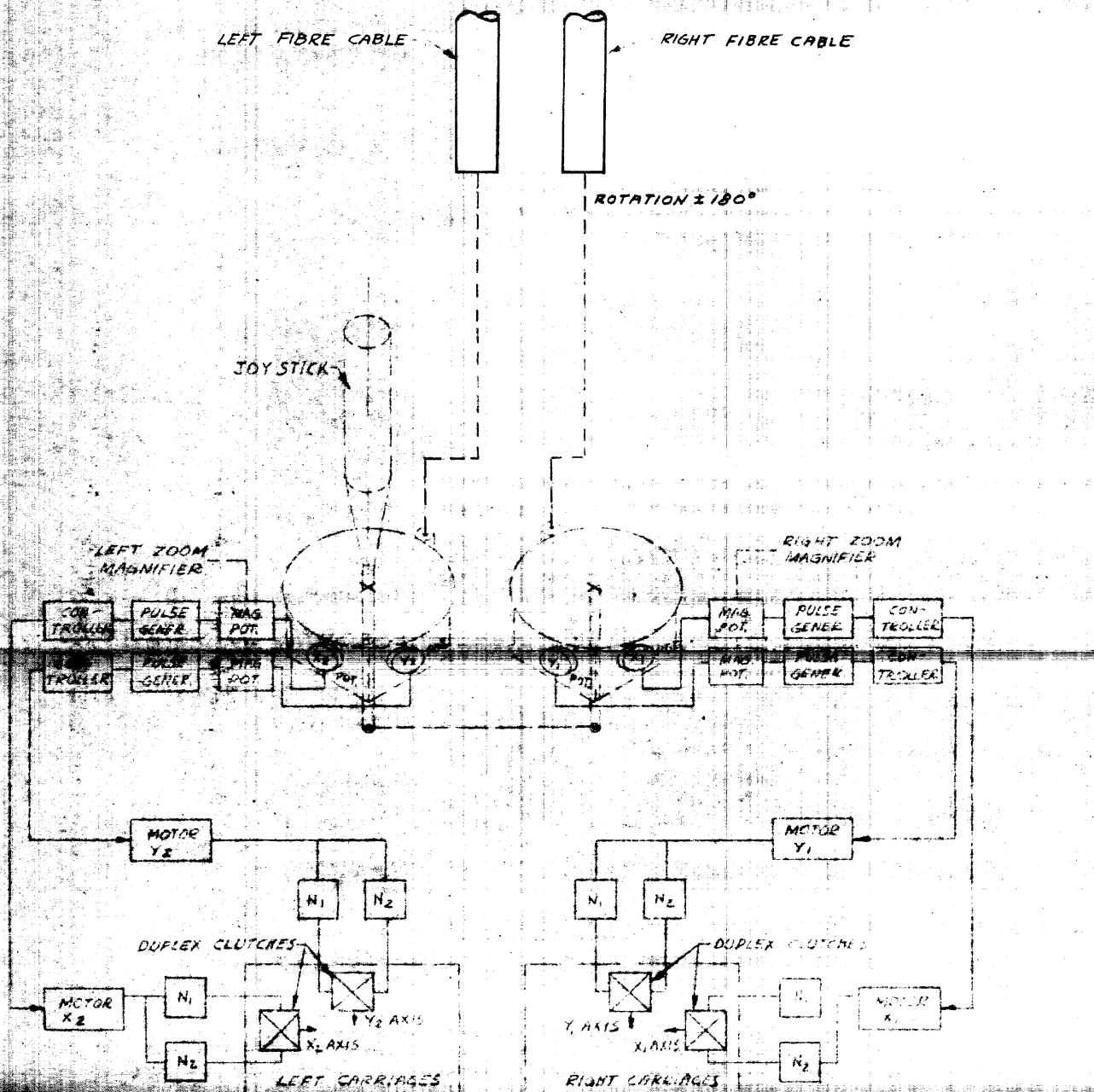


FIG 13
BLOCK DIAGRAM